(12) UK Patent Application (19) GB (11) 2 157 788 A

(43) Application published 30 Oct 1985

(21) Application No 8509037

(22) Date of filing 9 Apr 1985

(30) Priority data
(31) 8409309 (32) 11 Apr 1984 (33) GB

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(51) INT CL⁴
F16B 19/10

(52) Domestic classification
F2H 11B13 11B1D
U1S 1708 1773 F2H

(56) Documents cited
GB A 2131513 GB A 2015108 GB 1033805
GB A 2054785 GB A 2014900 GB 1029862
GB A 2034849 GB 1517624 GB 0956322
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(58) Field of search
F2H

(54) Anchoring devices

(57) An anchoring device 10, for anchoring together two structural members 26, 27 having pre-drilled aligned holes 28, 29, comprises an elongate rod 15 having projections 22 on its surface for the successive engagement in a constriction 20 of a cup member 12 as the rod 15 is drawn through the cup member 12. Formed separately or formed integrally with the setting member 12 is a deformable sleeve 21 which surrounds the rod 15, the sleeve 15 being deformed by abutment by the head 14 of the rod 15 so as to bulge radially outwardly so that its effective diameter is greater than the diameter of each of the holes 28, 29. The head 14 of the rod 15 may enter the sleeve 15 to expand it. The device 10 may be merely mounted in a single member, and the rod 15 or the cup member 12 may be formed with a hook.

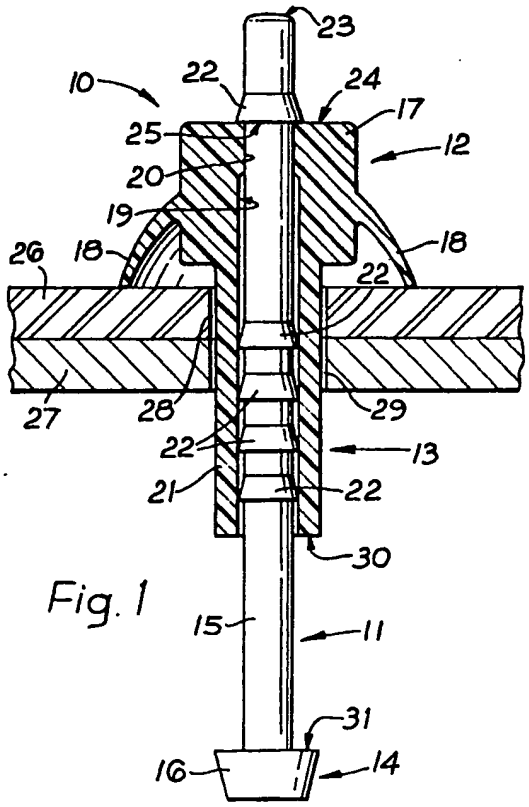

Fig. 1

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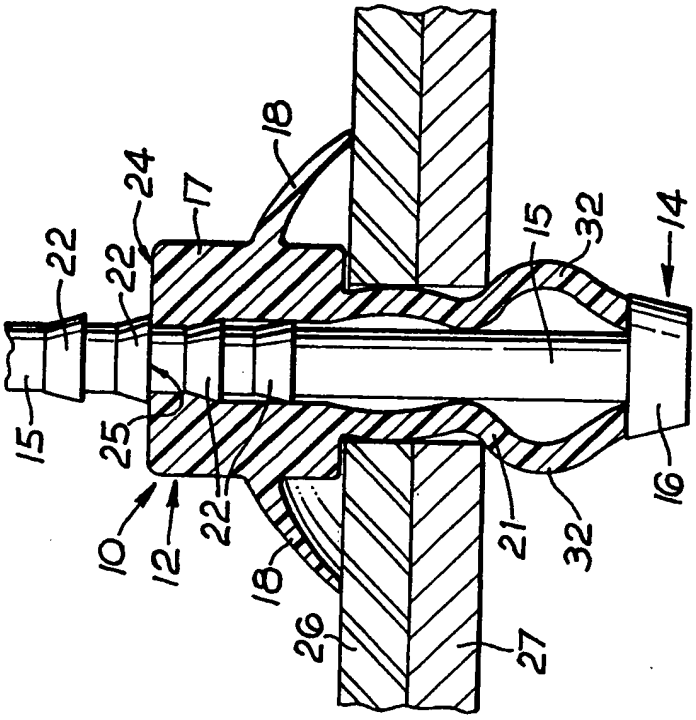
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Fig. 2

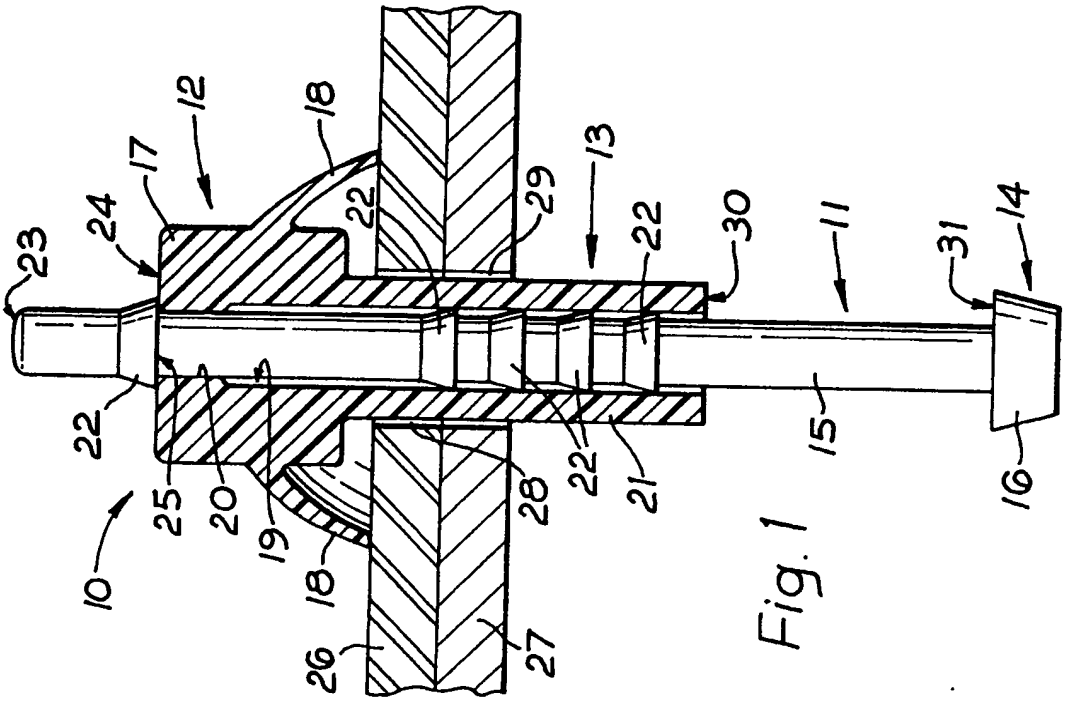
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Fig. 1

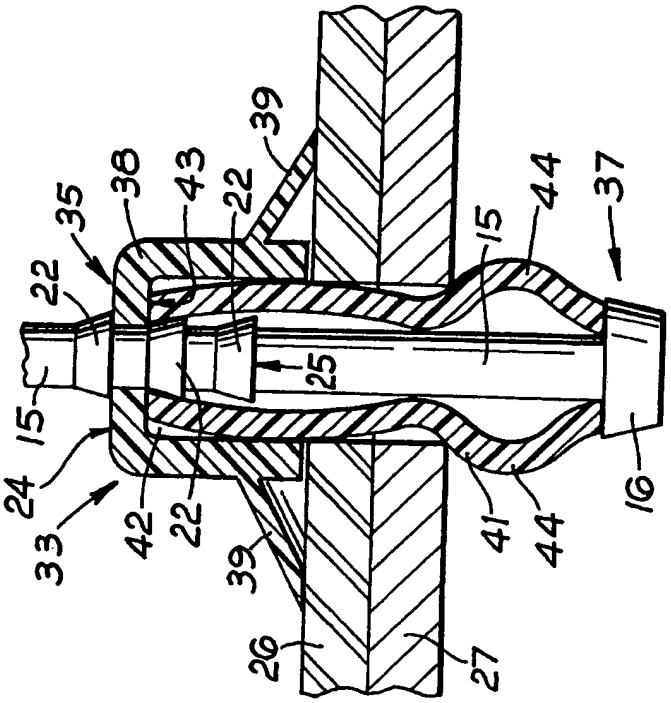
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Fig. 4

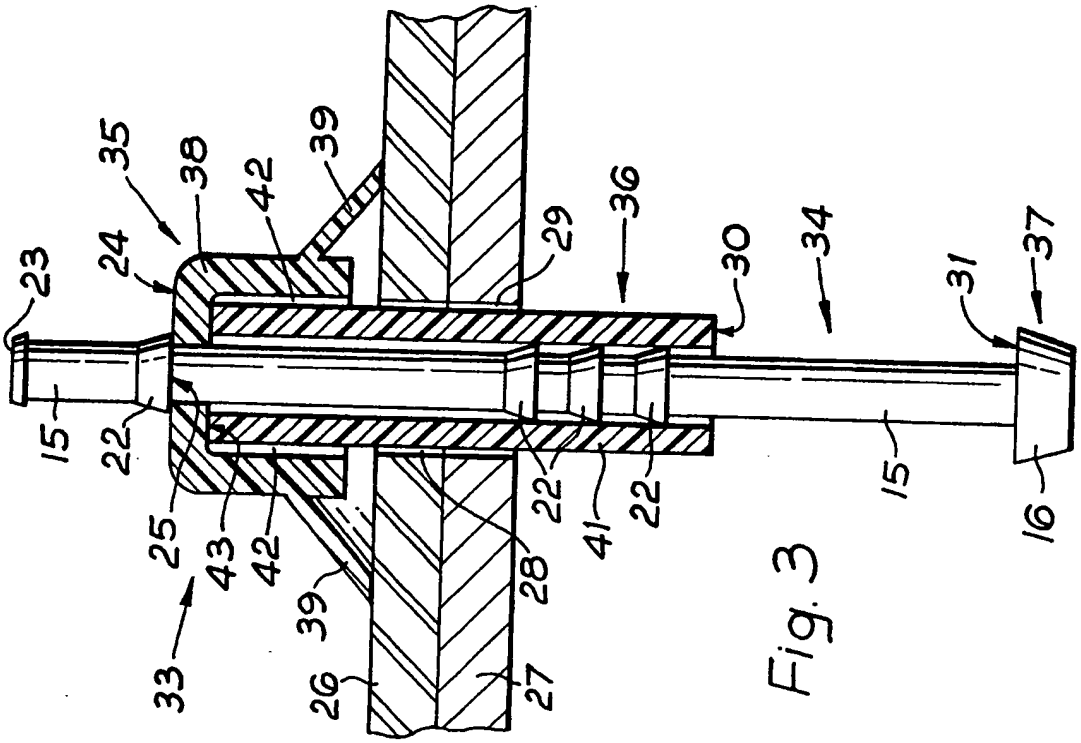
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Fig. 3

SPECIFICATION

Anchoring devices

This invention concerns anchoring devices of a type in which the setting of the device is achieved by the deformation of a deformable member, e.g. a resilient sleeve, of the device.

In particular, although not exclusively, the present invention is concerned with anchoring devices for the extra fixing of translucent skylights to roofs, wherein the skylight is already secured to the roof by steel hook bolts or other fasteners.

Known anchoring devices of the type as aforementioned normally comprise a tough natural or neoprene rubber sleeve with a nut bonded in one end of the sleeve and an integrally moulded external flange at the other end of the sleeve. When a threaded metal screw is inserted into the rubber sleeve through the flanged end (with the rubber sleeve already inserted into a borehole or boreholes in member or members in which the anchor is to be set so as to engage the nut) and is tightened, it causes the nut to move in the sleeve to deform the sleeve so that it bulges to form a second 'flange' on that side of the member(s) which is remote from that side thereof at which the anchor is inserted. Continued tightening of the screw increases the deformation of the rubber sleeve until secure setting of the anchor in the borehole(s) of the member(s) is achieved.

This known type of anchoring device is very reliable. However, they do possess certain inherent disadvantages. For instance the metal screw can be subject to corrosion. Also, because of the need for the screw to engage the nut accurately, the device is time consuming to set and to do so requires the use of a screw driver. Furthermore, it is difficult to assess when the screw is sufficiently tightened. All this can present difficulties when one is trying, for example, to anchor skylights, in the form of translucent plastics sheets, to roofs, particularly when commonly up to 25% of the roof area has to be covered. The correct size screw driver must always be carried. Furthermore, as roofs are exposed to harsh weather conditions setting of the latter type of anchoring device may not only be time consuming and unpleasant but also dangerous as one has to give great concentration to its setting. The danger factor is greatly increased if the roof is corrugated and the translucent skylight sheets are correspondingly corrugated.

With all aforementioned disadvantages in mind, it is an object of the present invention to provide an anchoring device which can be set quickly and easily while at the same time being at least as reliable as known anchoring devices.

This object is achieved in that the present invention provides an anchoring device comprising an elongate member, a setting member progressively engageable with the elongate member, a deformable member which can be associated with both the elongate member and the setting member, and, associated with the elongate member, deformation means for the deformable member, the device being insertable in a borehole(s) of a structural member (s) so that it can be set in or relative to the latter by progressively displacing the setting member and the elongate member relative to each other to cause the deformation means to act on the deformable member, bulgingly to deform the latter radially outward to a radial dimension which is greater than that of the borehole(s).

The invention will be described further, by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a part-sectional front elevation of a first preferred embodiment of the anchoring device of the invention 'in situ' in the boreholes of a substrate in its pre-set condition;

Figure 2 is a view similar to that of Fig. 1, but with the anchoring device in its set condition;

Figure 3 is a view identical to that of Fig. 1, but of a second preferred embodiment of the anchoring device of the invention; and

Figure 4 is a view identical to that of Fig. 2, but of the embodiment of the anchoring device of Fig. 3 in its set condition.

Both the preferred embodiments of the anchoring device of the invention are intended primarily for the extra fixing of skylights, for example in the form of translucent plastics sheets, to roofs. By the term extra fixing is meant the use of the anchoring device of the invention in addition to the fixing means (e.g. steel hook bolts) already employed. The extra fixing of skylights to roofs is essential if the wind which may get under the translucent plastic sheets forming the skylights is not to cause substantial damage to the roof due to sheets flapping loosely or indeed becoming entirely loose. Of course a wide variety of other uses for the anchoring device of the invention can possibly be envisaged.

Referring firstly to Fig. 1, the first preferred embodiment of the anchoring device of the invention, which is designated by the reference numeral 10, comprises an elongate member 11, a setting member 12, a deformable member 13 and deformation means 14 for the deformable member 13.

The elongate member 11 is in the form of a rod 15 of substantially circular cross-section along its entire length. The rod 15 forms the central portion or core of the device 10 and is made, for example, of a tough plastics material such as an injection moulded nylon.

The deformation means 14 for the deformable member 13 is provided at one end of the rod 15. Said deformation means 14 is in the form of an integral, stepped portion 16 of the

rod 15, of greater diameter than the rest of the rod 5. If the stepped portion 16 could be viewed in vertical cross-section it would have the appearance of an inverted truncated cone i.e. the sloped surface of the cone converging towards said one end of the rod 15.

The setting member 12 is in the form of a cup-like washer comprising a solid, main body part 17 and, extending from the main body part 17, a flexible, circular rim 18. Both the main body part 17 and the flexible circular rim 18 are of a fairly elastic material such as a plasticized P.V.C. or a soft nylon, or natural or synthetic rubber e.g. neoprene.

The main body part 17 has a central, U-shaped recess 19, at the base of which recess is a through borehole 20. The recess 19 is of a greater diameter than the diameter of the rod 15. The through borehole 20 is of the same diameter or of a slightly greater diameter than the diameter of the rod 15.

Formed integrally with the main body part 17 of the setting member 12, so as to extend downwardly therefrom, is the deformable member 13. Said deformable member 13 is in the form of a cylindrical sleeve 21, which is naturally made of the same elastic material as the main body of part 17 since it is integral with the latter. The diameter of the sleeve 21 is the same as that of the recess 19, so that there is a constantly uniform diameter from the through borehole 20 to that end of the sleeve 21 remote from the recess 19.

The rod 15 (elongate member 11) is provided with a plurality of spaced-apart projections 22 along its length. In the first preferred embodiment of the device 10 illustrated in Figs. 1 and 2, the rod 15 is provided with five projections 22 in total. Four of the five projections 22 are grouped together in the rod's central region, between its end 23 and stepped portion 16. The remaining projection 22 is situated adjacent the end 23 of the rod 15.

Each of the projections 22 is in the form of chamfer extending outwardly from the rod's surface at an angle of 15° with respect to the rod's central longitudinal axis. The slope of the surface of the chamfer converges toward the end 23 of the rod 15. The greatest diameter of the chamfer is the same as the internal diameter of the sleeve 21, but less than that of the borehole 20 of the main body part 17 of the setting member 12. It will be appreciated from the foregoing that the setting member 12 can be progressively secured relative to the elongate member 11 by end face 24 of the body part 17 of the setting member 12 engaging behind flat face 25 of each chamfer in turn.

The construction of the first preferred embodiment of the anchoring device will be further understood from the following description of its utilisation and with reference to both Figs. 1 and 2.

As illustrated in Figs. 1 and 2, the anchoring device 10 is used for joining together two confronting structural members 26 and 27 (only a part of each of which is shown). Said structural members may be part of a corrugated roof and a corrugated translucent plastic sheet providing a skylight for the roof.

Appropriate holes 28, 29 are first drilled in the members 26 and 27 and the holes 28, 29 are brought into alignment. The holes 28, 29 must be of sufficient diameter to allow the insertion therein of the device 10 stepped portion 16 first. Also, ideally, the device 10 may be used pre-assembled, with the setting member 12 and its integral deformable member 13 located on the elongate member 11 (i.e. rod 15), with the main body part 17 of the member 12 being between the first projection 22 (that is the one adjacent the end 23 of the rod 15) and the first projection in the group of four projections 22.

With the device 10 inserted into the holes 28, 29, that part of the rod 15 between the end 23 and the first projection 22 thereof is gripped with, for example, the jaws of a pair of pliers (not shown) in one hand of the user of the device 10. With the forefinger and thumb of his free hand, the user can grip the main body part 17 of the setting member 12. Using the pliers, the rod 15 can be drawn towards the user while he pushes down on the setting member 12 with his other hand. As the rod 15 and the setting member 12 move relative to each other, the main body part 17 of the setting member 12 engages over successive projections 22. Eventually, end 30 of the sleeve 21 comes into contact with flat surface 31 of the stepped portion 16. Indeed the surface 31 provides an abutment for the sleeve 31. With continued movement of the main body part 17 down the rod 15, the sleeve 21 starts to get deformed between the surfaces 23 of successive ones of the projections and the abutment provided by the surface 31 of the stepped portion 16 until the situation illustrated in Fig. 2 is achieved whereby a part 32 of the sleeve 21 bulges radially outwardly on the remote side of members 26, 27 to the extent that its effective diameter is greater than the diameter of the holes 28, 29 in the structural members 26, 27.

A point will be reached when the rod 15 and the setting member 12 are no longer capable of moving to any significant degree relative to each other. This is a clear indication that the device 10 is set and that the structural members 26, 27 are being held together firmly.

The second preferred embodiment of the anchoring device of the invention illustrated in Figs. 3 and 4, and designated generally by the reference numeral 33, is of similar construction to that of the first preferred embodiment of the device 10 illustrated in Figs. 3

and 4.

The second preferred embodiment of the anchoring device 33 comprises an elongate member 34, a setting member 35, a deformable member 36 and deformation means 37 for the deformable member 36.

The elongate member 34 and the deformation means 37 have the same construction as in the first preferred embodiment and, therefore, the same reference numerals have been used to designate their parts.

The setting member 35 and the deformable member 36 are of slightly different construction in that they are not integral with one another, as in the first embodiment 10, but are separate.

The setting member 35 is in the form of a substantially inverted, U-shaped cup 38 and, diverging outwardly from the upstanding limbs of the cup 38, a flexible circular rim 39. The cup 38 and the rim 39 are of a fairly elastic material such as a plasticized P.V.C. or a soft nylon, or natural or synthetic rubber e.g. neoprene. At the base of the cup 38 there is a through borehold 40 of the same or of a slightly greater diameter than the rod 15 of the elongate member 34.

The deformable member 36 is in the form of an elongate, cylindrical sleeve 41 having an internal diameter which is greater than the diameter of the rod 15 and approximately the same diameter as the greatest diameter of the projections 22 of the rod 15. The sleeve 41 is of an elastic or resiliently deformable material. The material can be the same as that of the cup 38 or of a different but complementary material. The sleeve 41 firmly surrounds the rod 15. The internal diameter of the cup 38 is such that it provides a recess 42 for one end of the sleeve 41.

The utilisation of the second preferred embodiment of the device 33 is virtually the same as that of the first preferred embodiment of the device 10. As can be seen from Fig. 4, as the cup 38 of the setting member 35 engages over successive projections 22, the sleeve 41 is deformed between the abutment 31 of the deformation means 37 and the cup's internal base 43. A part 44 starts to bulge radially outwardly until it has a radial dimension which is greater than the diameter of the holes 28, 29 in the structural members 26, 27. Again, the device 33 is set when the rod 15 and setting member 35 are no longer capable of moving relative to one another to any significant degree.

In both the first and second embodiments of the device, that portion of the rod 15 sticking up above the setting member 12 or 35 can be snipped off, as illustrated in Figs. 2 and 4.

Furthermore, the circular rims 18 and 39 of the setting members 12 and 35 respectively act as a skirt in sealing contact with the structural member 26 so as to prevent the ingress of water through the holes 28, 29 in the members 26, 27.

It will be appreciated from the foregoing that the present invention proposes an anchoring device which can be set quickly and reliably, and without the need for the use of any specialised tool such as a screw driver of a particular size.

The invention is not confined to the aforedescribed embodiments, and variations may be made thereto within the scope of the invention. Thus, for example, the deformable member instead of being deformed by contact with the abutment provided by the deformation means can be deformed by the deformation means entering the sleeve of the deformable member so as to bulge it outwardly.

Although the preferred embodiments of the anchoring device have been described and illustrated as being utilised for the fixing together of two abuting structural members, it can also be utilised for setting in a single structural member (for example a door or a wall) and with the elongate member or the setting member having a hook (e.g. coat hook, picture hook).

CLAIMS

1. An anchoring device comprising an elongate member, a setting member progressively engageable with the elongate member, a deformable member which can be associated with both the elongate member and the setting member, and, associated with the elongate member, deformation means for the deformable member, the device being insertable in a borehole(s) of a structural member(s) so that it can be set in or relative to the latter by progressively displacing the setting member and the elongate member relative to each other to cause the deformation means to act on the deformable member, bulgingly to deform the latter radially outward to a radial dimension which is greater than that of the borehole(s).

2. A device as claimed in claim 1 wherein said elongate member is in the form of a rod of substantially circular cross-section along its entire length, the rod forming a central portion or core of the device.

3. A device as claimed in claim 2 wherein the rod has a plurality of projections along its length, the setting member being progressively and selectively engageable with the projections.

4. A device as claimed in claim 3 wherein each projection is in the form of a chamfer extendingly outwardly from the rod's surface at an angle of 15° with respect to the rod's central longitudinal axis, the slope of the surface of the chamfer converging toward the rod's insertion end into the hole(s) of the structural member(s).

5. A device as claimed in any preceding claim wherein the deformation means is pro-

vided at one end of the rod and is in the form of an integral stepped portion of greater diameter than the rest of the rod.

6. A device as claimed in any preceding claim wherein the setting member is in the form of cup-like washer comprising a solid main body part and, extending from the main body part, a flexible, circular rim.

7. A device as claimed in claim 6 wherein the main body part has a central U-shaped recess, at the base of which recess is a through borehole, the recess being of greater diameter than the diameter of the rod and the through borehole being of the same or a slightly greater diameter than the diameter of the rod.

8. A device as claimed in claim 6 or 7 wherein the setting member is formed integrally with the main body part and is in the form of a cylindrical sleeve, extending downwardly from the main body part and of the same material as the main body part.

9. A device as claimed in any one of claims 1 to 5 wherein the setting member is a substantially inverted U-shaped cup with a flexible circular rim diverging outwardly from the cup, the base of the cup having a through borehole for the rod of the elongate member.

10. A device as claimed in any one of claims 1 to 5 and claim 9 wherein the deformable member is an elongate, cylindrical sleeve, separate from but associated with the cup of the setting member, having an internal diameter which is greater than the diameter of the rod and of approximately the same diameter as the greatest diameter of the projections of the rod.

11. A device as claimed in any preceding claim wherein the deformation means has a flat surface providing an abutment against which the end of the sleeve of the deformable member can abut from the deformation of said sleeve.

12. An anchoring device substantially as hereinbefore described with reference to and as illustrated in Figs. 1 and 2, or in Figs. 3 and 4 of the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.